

trench isolation regions include “a conformal oxide liner confined within and along sidewalls of the planarized trench isolation region”. Applicants have also amended Claim 28 to positively recite that the “conformal oxide layer has rounded corners between a top surface of said substrate and a trench dielectric filling said at least one planarized trench isolation region”.

Support for the aforementioned amendments to Claim 28 is found throughout the originally submitted application: See, for example, Page 5, lines 15-20, Page 10, lines 5-11, and Fig. 2C – Fig. 2E. More specifically, referring to Page 10, lines 5-11 of the submitted specification, applicants disclose that, “Fig. 2C, comprises oxidizing the trench **110** as well as the exposed sidewalls of oxide layer **104** and polysilicon layer **106** under conditions that are capable of growing a conformal oxide layer **112** on the sidewalls of the trench **110** extending up to, but not beyond, the polysilicon layer **106** of the film stack **102**.” Further, as depicted in Fig. 2D – Fig. 2E, layer stack **102** is removed so that the final trench isolation region includes a conformal oxide layer **112**, confined within the trench **110**, having rounded edges **115** between the top surfaces of the substrate **100** and the trench dielectric **114**.

Support for the amendment to Page 12, lines 1-15 of the specification is found in the originally submitted Fig. 2E, where a conformal oxide layer **112**, is depicted lining a trench **110** within a substrate **100**. The conformal oxide layer **112** confined within trench region **110** includes rounded corners between the top surface of the substrate **100** and the trench dielectric **114** as indicated by reference number **115** in corrected Fig. 2E. Applicants have made minor changes to Fig. 2E which are shown in red ink in the drawing copy included within applicants’ letter to the official draftsman.

Since the above amendments to the claims do not introduce any new matter into the application, entry thereof is respectfully requested. As required by 37 C.F.R. §1.121,

applicants have attached a marked-up copy of Claim 28 and Page 12, lines 1-15 of the specification. The attachment is captioned as "**MARKED UP VERSION SHOWING CHANGES MADE**".

Claim 28 stands rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite for failing to particularly point and distinctly claim the subject matter which applicant regards as the invention. Specifically, it is the Examiner's position that it is unclear whether the rounding is occurring at the trench liner or at the trench corner.

In response thereto, applicants have amended Claim 28 to clearly and distinctly recite that, "conformal oxide liner has rounded corners between a top surface of said substrate and a trench dielectric filling the at least one planarized trench isolation region" as depicted in Fig. 2E. Additionally, the specification has been amended to reflect the proposed corrections to originally submitted Fig. 2E, where the rounded corner is indicated using reference number 115.

Applicants respectfully submit that the above amendment to Claim 28 obviates the §112 second paragraph rejection. Applicants thus respectfully request reconsideration and withdrawal of the indefiniteness rejection.

Claims 28 - 32 stand rejected under 35 U.S.C. §102(e) as allegedly anticipated by U.S. Patent No. 6,027,982 to Peidous, et al. ("Peidous, et al."). It is the Examiner's position, that Peidous, et al. disclose the limitations of, "trench isolation regions formed within a substrate 35 electrically isolating adjacent active device regions from each other, said planarized trench isolation regions containing rounded corners 38 between the top surfaces of the trench isolation regions and the substrate".

It is axiomatic that anticipation under §102 requires the prior art reference to disclose every element to which it is applied. In re King, 801 F.2d 1324, 1326, 231 USPQ 36, 138

(Fed Cir, 1986). Thus, there must be no differences between the subject matter of the claim and the disclosure of the prior art reference. Stated another way, the reference must contain within its four corners adequate direction to practice the invention as claimed. The corollary of the rule is equally applicable: absence from the applied reference of any claimed element negates anticipation. Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571, 230 USPQ 81, 84 (Fed. Cir. 1986).

Applicants submit that the claims of the present application are not anticipated by the disclosure of Peidous, et al., since the applied reference does not disclose applicants' claimed structure, as recited in amended Claim 28. Specifically, Peidous, et al. do not teach applicants' claimed structure comprising a planarized trench isolation region **116** containing a conformal oxide liner 114 confined within and along sidewalls of said planarized trench isolation regions 116, where said conformal oxide liner **114** has rounded corners **115** between top surfaces of said substrate **100** and a trench dielectric **114** filling the planarized trench isolation region.

Applicants' claimed structure, as depicted in Fig. 2E, includes a trench isolation region where a trench **110** is formed in a substrate **100** and is conformally lined with an oxide layer **112** that terminates with rounded corners **115** at the junction between the top surfaces of the substrate **100** and the trench dielectric **114**.

Peidous, et al. produce a structure where an oxide layer **37** is not confined within the trench isolation regions but extends outside the trench region and atop the substrate surface, as depicted in Fig. 6- Fig. 12. Specifically, Peidous, et al., referring to Column 2, lines 66-67, teach that, "a layer of liner oxide **37** is grown on the exposed silicon of the trench." "Referring now to Figure 7...as this liner oxide **37** grows into and out of the exposed silicon surfaces, it causes a rounding of the trench at the active corner **38**." See Peidous, et al.,

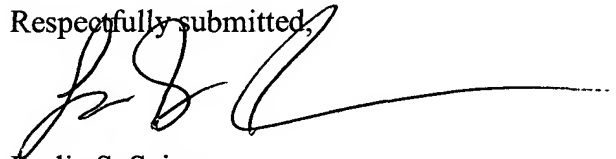
Column 3, lines 62-67. Peidous, et al. do not teach that the liner oxide be confined within the trench, as recited in amended Claim 28, but instead deposits liner oxide within and outside the trench so that oxide liner extends onto the top surface of the substrate. It is this extension which provides the rounded corners to the liner material in Peidous, et al.

The forgoing remarks clearly demonstrate that the applied reference does not teach each and every aspect of the claimed invention as required by King and Kloster Speedsteel; et al., therefore the claims of the present application are not anticipated by the disclosure of Peidous, et al. Applicants respectfully submit that the instant §102 rejection has been obviated and withdrawal thereof is respectfully requested.

Wherefore reconsideration and allowance of the claims of the present application are respectfully requested.

In summary, applicants respectfully submit that this application is in condition for allowance. Accordingly, applicants respectfully request that this application be allowed and a Notice of Allowance be issued. If the Examiner believes that a telephone conference with the applicants' representatives would be advantageous to the disposition of this case, the applicants request that the Examiner telephone the undersigned.

Respectfully submitted,



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MARKED UP VERSION SHOWING CHANGES MADE

IN THE CLAIMS

Please amend Claims 28, as follows:

28. (Amended) A semiconductor device comprising at least one substantially planarized trench isolation region formed within a substrate electrically isolating adjacent active device[s] regions from each other, said at least one planarized trench isolation region containing a conformal oxide liner confined within and along sidewalls of said at least one planarized trench isolation region, wherein said conformal oxide liner has rounded corners between [the] a top surface[s] of said [the trench isolation region and the] substrate and a trench dielectric filling said at least one planarized trench isolation region.

IN THE SPECIFICATION:

Please amend Page 12, lines 1-15, as follows:

Page 12, lines 1-15: Next, as shown in Fig. 2E, the structure thus formed is planarized down to the surface of the substrate utilizing a conventional planarization process such as chemical-mechanical polishing (CMP) or grinding. Thus, during the planarization step, the various layers of the film stack are removed. As shown in Fig. 2E, the method of the present invention does not form any substantial divots at either of the STI/substrate corners. Divot formation is substantially phased away in the present invention because the conformal oxide layer formed in the manner indicated above, etches at a slower rate than the trench dielectric material. This differential in etch rate prevents the formation of a divot at the STI/substrate corner. Instead, rounded corners [115] are formed in the present invention, as shown in Fig. 2E.